The Tarahumara Frog: Return of a Native

by Jim Rorabaugh and
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For almost two decades, the Tarahumara frog *(Rana tarahumarae)* has been absent from the southern Arizona canyons and deep plunge pools to which it had adapted over millennia. Today, the Tarahumara Frog Conservation Team, a consortium of researchers, interested members of the public, and representatives from state and federal wildlife and land management agencies, is making strides toward returning this extirpated species to Arizona.

The Tarahumara frog is known historically from 63 localities within montane canyons from extreme southern Arizona south to northern Sinaloa and southwestern Chihuahua, Mexico. Its range is thought to be centered in the northern Sierra Madre Occidental of Mexico, but the eastern and southern distributional limits are not clear. Most localities are in the mountains of eastern Sonora. In the United States, the frog was known historically from only six locales in Arizona near the Mexican border, including three in the Santa Rita Mountains and three in the Atascosa-Pajarito-Tumacacori mountain complex, but it became extirpated from all six. The last observation of a Tarahumara frog in Arizona was in May 1983 in Big Casa Blanca Canyon in the Santa Rita Mountains, Arizona.

Throughout its range, the Tarahumara frog is typically associated with canyons and deep plunge pools formed among boulders or in bedrock. Plunge pools in canyons with low mean flows (less than 0.2 cubic feet/second or 5.6 liters/second) and relatively steep gradients (more than 196 feet/mile or 60 meters/kilometer of stream) provide the best breeding sites. Permanent water is probably necessary for metamorphosis. Suitable Tarahumara frog habitats are located within oak and pine-oak woodlands and in the Pacific coast tropical area (Sinaloan thornscrub and tropical deciduous forest) on the edge of the desert.

Why the Tarahumara frog disappeared from Arizona is not clear. Probably a combination of factors is responsible, including winter cold, flooding, severe drought, competition, predation, disease, and heavy metal poisoning. Airborne pollutants from copper smelters or acidic rain that mobilizes naturally-occurring metals near streams may have resulted in toxic levels of cadmium. Chytridiomycosis, a fungal disease implicated in global declines of frogs and toads, was found recently in populations of the Tarahumara frog, and has likely contributed to observed declines and extirpations. Predation by nonnative fishes and bullfrogs was probably an important factor in the disappearance of the species from Pena Blanca Spring and portions of Pena Blanca Canyon, Arizona.

Steve Hale, an expert on the Tarahumara frog, and Kim Field, Arizona Game and Fish Department, examine the frog's historic plunge pool habitat in Sycamore Canyon, Arizona, near the Mexican border.
All photos by Jim Rorabaugh

A restoration program developed by the Tarahumara Frog Conservation Team calls for reestablishing the frog into at least two of its historic localities in Arizona. The team has identified Big Casa Blanca Canyon in the Santa Rita Mountains and Sycamore Canyon in the Pajarito Mountains as the two favored sites. Because the factors leading to the frog's extirpation at these sites may still exist, the reestablished populations will be considered experimental and will be monitored carefully to identify any persistent problems.

In May 2000, part of a Tarahumara frog egg mass was collected from the Sierra La Madera in northern Sonora (the closest known population to historic localities in the United States.) and imported to Arizona under permit for initial rearing by the U.S. Fish and Wildlife Service in Phoenix. The egg mass contained about 850-900 eggs and hatched 8 days after collection. The tadpoles grew rapidly, and many were moved to other rearing facilities in Arizona, including aquaria and more natural settings at the Arizona-Sonora Desert Museum, San Bernardino National Wildlife Refuge, Buenos Aires National Wildlife Refuge, Coronado National Memorial, and Arizona State University.

The first young metamorphosed frogs were observed outdoors at the Buenos Aires Refuge only 86 days after hatching. This was a surprise because we thought the tadpoles normally took at least a year to become frogs. Perhaps warm water and an abundance of high quality food resulted in faster development. However, only a portion of the tadpoles metamorphosed rapidly; others grew more slowly. As of September 2001, a few were still tadpoles. Could some tadpoles be "programmed" to metamorphose rapidly, while others are not? This phenomenon has been observed in other frogs and may be an adaptation for maximizing frog production and survival under a variety of environmental conditions. Many of the frogs that metamorphosed early are now adults, and some have bred at the Arizona-Sonora Desert Museum. In the summer of 2001, the Detroit Zoo's National Amphibian Conservation Center joined as a cooperator in the project and is now rearing young Tarahumara frogs.

Because all of our captive frogs originated from a single egg mass, we will need additional collections from the wild to establish genetically strong populations. Even then, we must breed the frogs selectively to maximize genetic diversity. Recent successes with captive breeding at the Arizona-Sonora Desert Museum are encouraging.

If this approach turns out to be successful in the long run, captive breeding will reduce the need to remove additional animals from wild populations in Sonora. Today, we have about 350-400 frogs and tadpoles, which we'll hold until we have approval to release them into historic habitats.

With funding from the Fish and Wildlife Service's North American Free Trade Agreement Borderlands Program, the Tarahumara Frog Conservation Team and the Arizona Game and Fish Department are pursuing approval from the Arizona Game and Fish Commission (a separate state entity) to reestablish the frog in Big Casa Blanca and Sycamore canyons in 2002. Several releases will likely be needed to establish viable populations of the frog.

The Tarahumara frog lacks the bold, distinct dorsolateral folds characteristic of related leopard frogs and other ranid species. The larvae are greenish-yellow with small dark spots over the dorsum and larger spots on the tail, and they grow as large as 3.8 inches (97 millimeters) prior to metamorphosis. Juvenile and adult frogs of both sexes have a call consisting of a low grunt of about one-half second in duration, uttered once or twice or sometimes more.

For more information about the ecology, status, rearing, and conservation of the Tarahumara frog, visit the Service's Arizona Ecological Services Office website at `http://arizonaes.fws.gov/T-frog3.htm`.

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